

IPPD Gains Increased Emphasis Through Publication of New DoD Handbook

**Meeting Cost and Performance Objectives
From Product Concept Through Production**

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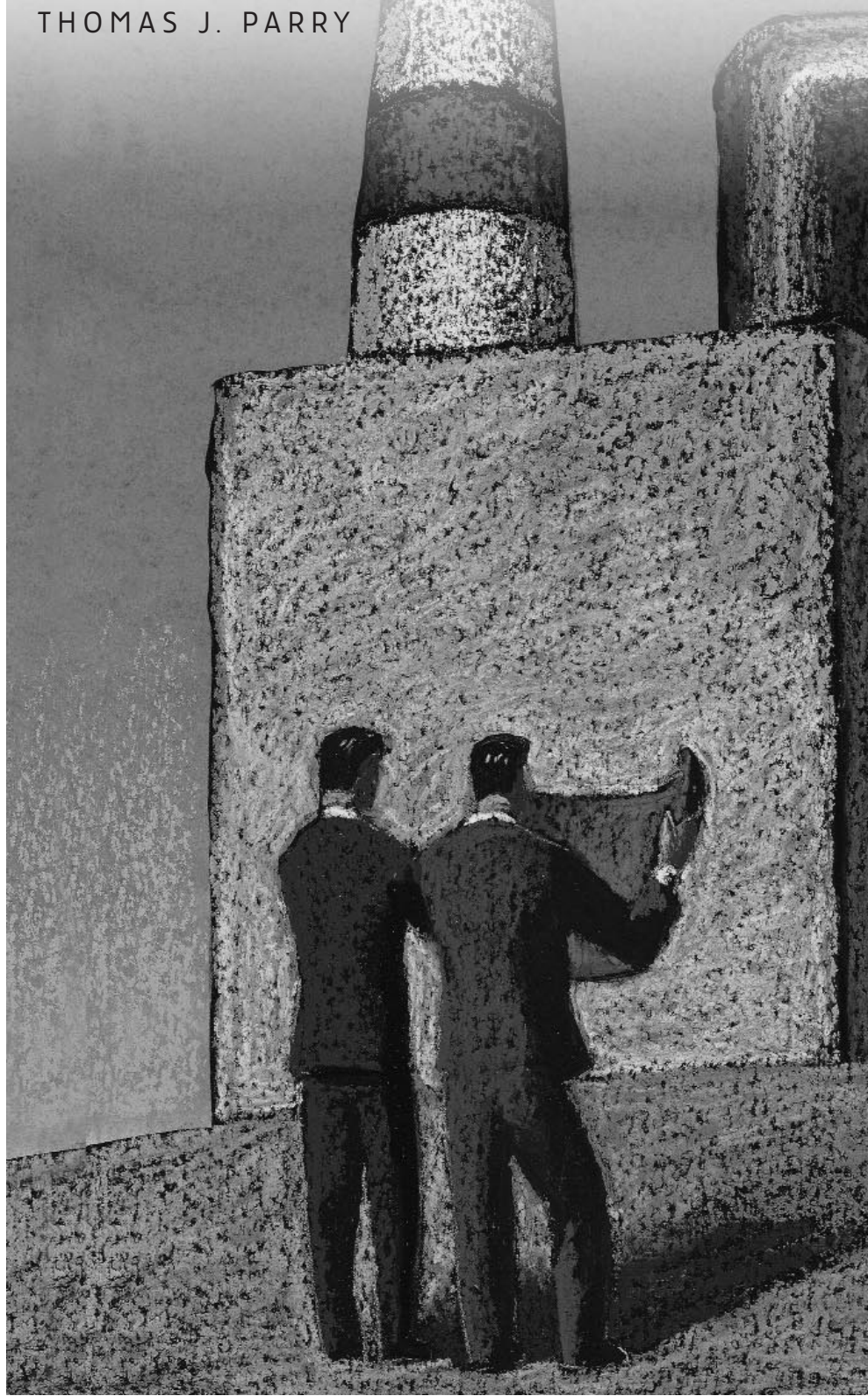
As early as 1992, a Defense Science Board (DSB) report first recommended implementation of Integrated Product and Process Development (IPPD) within DoD. In 1994, with the impetus for reforming the DoD acquisition process gaining momentum, newly enacted legislation, particularly the Federal Acquisition Streamlining Act (FASA), opened the door for innovative management techniques such as the IPPD.

In 1995, realizing the need for a fundamental change in the way the Department acquires goods and services, [then] Defense Secretary William Perry issued a memorandum mandating that the concepts of IPPD and Integrated Product Teams [IPT] be applied throughout the acquisition process to the maximum extent practicable.¹

Why did Secretary Perry consider IPPD to be of such value to the acquisition process that he mandated its application? How is it to be “applied throughout the acquisition process?” By whom?

The task of answering frequently asked questions and “getting the word out” to the acquisition workforce fell to Systems Engineering within the Office of the Under Secretary of Defense (Acquisition and Technology). From our view, we could not start that process without first

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defining IPPD and all it embodies in a way that the acquisition workforce could relate to their day-to-day activities.

IPPD — A Management Approach

Beginning our efforts in 1995, we set out to establish policy and publish guidance on what IPPD is and how to implement it. Using Perry's original memorandum

and several acquisition reform studies, we drafted and received approval of the new wording for inclusion in DoD Directive 5000.1 and DoD Regulation 5000.2-R relative to implementing IPPD on major weapon system programs.^{2,3} DoD 5000.2-R defines IPPD as:

A management technique that simultaneously integrates all essential ac-

quisition activities through the use of multidisciplinary teams to optimize the design, manufacturing, and supportability processes. IPPD facilitates meeting cost and performance objectives from product concept through production, including field support.

In February 1996, our office published the *DoD Guide to IPPD*, which addresses three major components of IPPD: tools, teams, and processes.⁴ Coupled with the *Rules of the Road — A Guide for Leading Successful Integrated Product Teams*,⁵ which provides a discussion of oversight IPTs, the guide laid the foundation for use of IPPD in the Department.

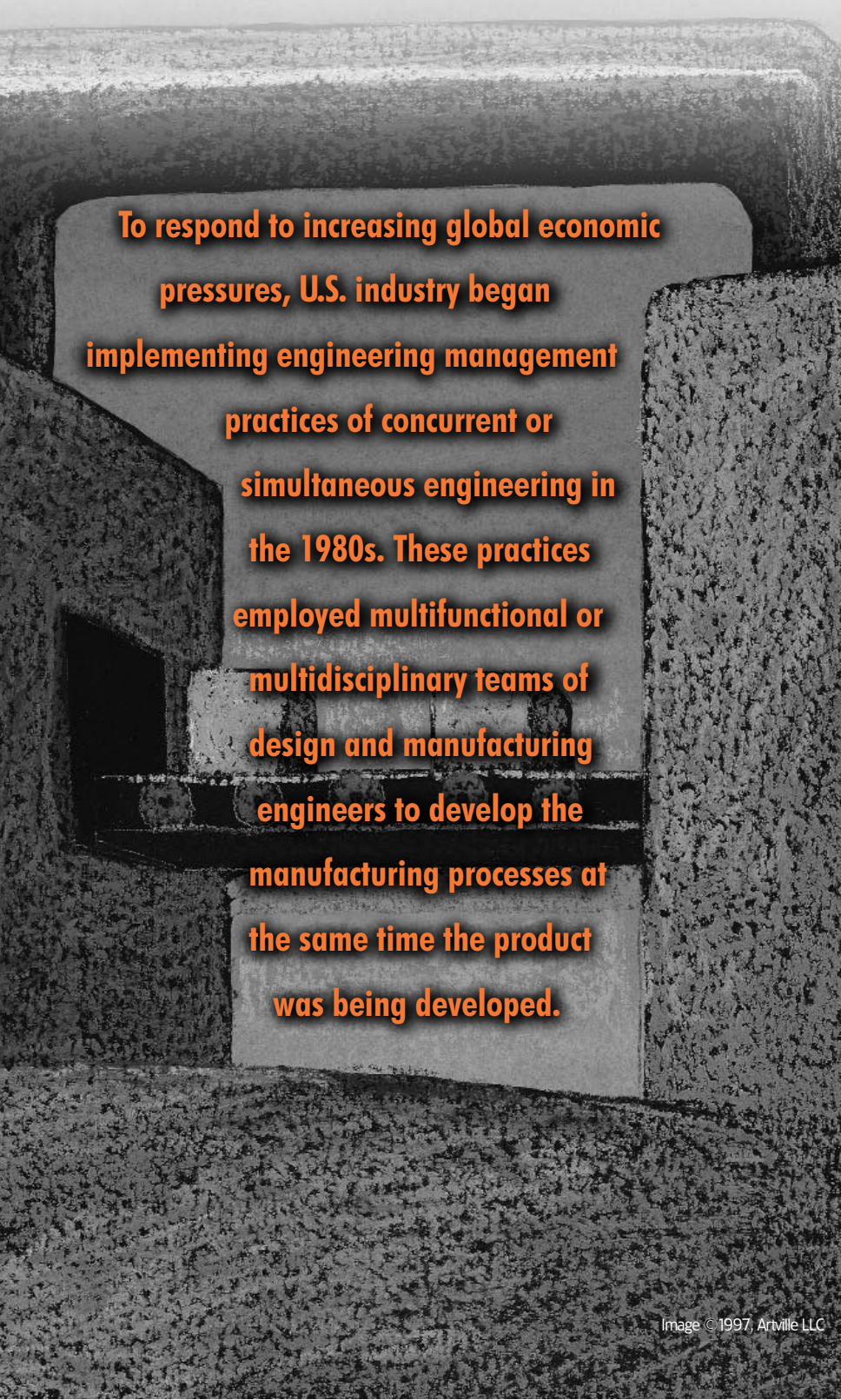
That was four years ago. Today, to further help program managers in their implementation of IPPD, we recently published the *DoD IPPD Handbook*.⁶

This article reemphasizes the need for IPPD in defense acquisition programs and presents a chapter-by-chapter recap of our latest handbook and its contents. Before we get into the handbook, however, a brief recap of IPPD and its history is in order.

Need for IPPD

To respond to increasing global economic pressures, U.S. industry began implementing engineering management practices of concurrent or simultaneous engineering in the 1980s. These practices employed multifunctional or multidisciplinary teams of design and manufacturing engineers to develop the manufacturing processes at the same time the product was being developed. By “designing it right the first time” and cutting scrap, rework, and engineering change proposals, companies cut cycle time and costs, while improving quality.

IPPD expanded on concurrent engineering, including developing all the processes parallel with the product. More than product and process engineering functions, IPPD also includes all stakeholders — those developing not only the product, but all product-related processes, such as test and evaluation, manufacturing, support, operations and training, as well as business processes.



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Multidisciplinary teams can include the primary stakeholders – the customers or users – and personnel from functions such as design, manufacturing, maintenance, test, quality, finance, and contracting.

A significant number of documented cases credit IPPD directly or cite generic practices and tools that correspond to the IPPD approach for reductions in cost and cycle time, and increases in quality and performance. These cases are widespread and encompass DoD as well as commercial programs.

Two DoD programs, which were studied in depth, revealed that design milestones were achieved 2.5 years sooner than an earlier comparative program, and that changes to the design were less than 10 percent of the changes made in the earlier program. In another DoD program, IPPD implementation resulted in the design and production of some parts with higher quality and a cost reduction of 30 percent.

In almost every case, the programs reported better working relationships between government and industry and identified risk and problems earlier. Ultimately, early problem solving resulted in reduced cost and a product performance that better met the customer's requirements.

What's in the Handbook?

Program office personnel and their counterparts on industry program teams are the target audience for the handbook. Besides telling you how to get started in IPPD, the handbook suggests methods and specific tools that program managers can use to implement IPPD – no matter where they are in the acquisition process. Interspersed with the text are implementation examples from acquisition programs and industry. Program managers should keep in mind, however, that there are many ways to accomplish IPPD.

IPPD is a management approach, not a specific set of steps to be followed. The seven chapters in our latest handbook contain information to help decide which

techniques and tools are best suited to your program.

CHAPTER 1

The handbook begins by introducing definitions of relevant terms and principles, such as stakeholder involvement, customer focus, early and continuous life cycle planning, concurrent development of products and processes, and proactive identification and management of risk.

CHAPTER 2

Chapter 2 is the essence of the handbook and explains the application of IPPD across the DoD acquisition process. The greatest detail is given for Phases 0 and I because this is where implementation of IPPD gives the biggest payoff.

CHAPTER 3

Chapter 3 discusses team best practices, specifically working-level IPTs, including team structure, member selection and training, team management, charters, and team meetings.

CHAPTER 4

Covering IPPD metrics for products, processes, and progress, Chapter 4 discusses several examples of metrics that could be used by programs and further addresses the metrics development process.

CHAPTER 5

Containing information on integrated information environments, Chapter 5 includes information on shared databases, electronic business, groupware, use of the Internet, and security.

CHAPTER 6

Containing a thorough discussion of the necessary connection between IPPD and modeling and simulation (M&S), Chapter 6 explains the use of Simulation Based Acquisition (SBA), tells how M&S is addressed in DoD, and provides several examples of the use of M&S for early decision making in IPPD.

CHAPTER 7

The last chapter concludes the handbook with descriptions of additional tools that can offer substantial benefits

in an IPPD environment. These include tools to assist decision making, such as Quality Function Deployment, defect prevention tools, and cost models.

Why Would You Even Want to Use IPPD?

To answer that question, let me address four principles of IPPD that I believe will help you achieve the benefits of IPPD implementation on your programs.

Stakeholder Involvement and Customer Focus.

A stakeholder is an organization or functional activity that has a stake in the decision at hand or the outcome of the program. The term stakeholder also is used for the empowered working-level representatives of that organization or functional activity who serve on IPTs. As such, stakeholders are important decision makers. They control the resources and collectively have the know-how to get the job done.

The term "stakeholder" is used throughout the handbook in both senses of the word. The handbook stresses the importance of having empowered representatives (stakeholders) from all of the functional areas involved with the product and processes – all who have a stake in the success of the program – such as design, manufacturing, test and evaluation, logistics, personnel, and, especially, the customer.

IPPD management practices promote a customer focus by including the customer in decision making and on the multidisciplinary teams. These teams conduct trade studies during the requirements definition and development processes to ensure that the design remains consistent with customer needs and is affordable. One such trade-off analysis process that is focused on reducing and controlling life cycle cost, while meeting customer needs, is called Cost As an Independent Variable.

Concurrent Development of Products and Processes.

Concurrent development of products and processes refers to the simultaneous development of the deliverable product (hardware and software) and all of the processes necessary,

not only to make that product, but to make that product work. The effective development of these processes can significantly influence the acquisition and life cycle cost. Examples include the manufacturing processes needed to fabricate the product, the logistics support processes needed to support the product, or the processes to collect and disseminate information. Emphasizing design of these processes, *while* the product is being designed, helps avoid costly, complicated, or unworkable supporting processes when the product is produced and fielded.

Not developing the processes concurrently with the product could wipe out other potential cost reductions by using an inefficient manufacturing and support process, or by causing a redesign of the product. Concurrent development of the hardware and the software significantly eases hardware and software integration.

Multidisciplinary teamwork through IPTs, with an emphasis on real-time and open communication, is key to accomplishing this concurrent development. An enhanced communication environment that includes a shared database where stakeholders can access information is of primary importance to the efficiency of concurrent development.

Another enabling tool for concurrent development is M&S. Alternative product and process concepts and designs can be “played out” in models and simulations early in the process to aid in decision making and trade-offs.

Seeking to streamline ways in which it acquires systems, DoD is looking at M&S tools as a potential way to reduce the time, resources, and risk associated with the process, while improving the quality of the systems produced through SBA.

Early and Continuous Life Cycle Planning. Early and continuous life cycle planning is accomplished by having stakeholders, representing all aspects of a product’s life cycle, as part of the mul-

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tidisciplinary teams. Early life cycle planning with customers, functions, and suppliers lays a solid foundation for the various phases of a product and its processes. Key program activities and events are defined so that progress toward cost-effective targets can be tracked, resources can be applied, and the impact of problems, resource constraints, and requirements changes can be better understood and managed. Early emphasis on life cycle planning ensures the delivery of a functional, affordable, and supportable system.

Proactive Identification and Management of Risk. IPPD is not a “design now, test later” approach to product and process development. Proactive identification and management of risk is accomplished in many ways in the IPPD environment.

IPPD is key to an organized, comprehensive, and iterative approach for identifying and analyzing cost, performance,

and schedule risks and for executing mitigating actions to control critical risk areas. IPTs develop technical and business performance measurement plans with appropriate metrics to monitor the effectiveness and degree of anticipated and actual achievement of technical and business parameters.

M&S tools are used to simulate, test, and evaluate the product prior to starting production. For example, the Simulation, Test, and Evaluation Process (STEP) is a major DoD initiative designed to improve the acquisition process by integrating M&S with test and evaluation.⁷ STEP moves beyond the “test-fix-test” approach to a “model-simulate-fix-test-iterate” approach. Problems are fixed as they are discovered.

In addition, robust design methods are used to minimize problems in manufacturing and operations. Event-driven scheduling is used to integrate all development tasks and ensure that a task is not started until all prerequisite tasks are complete.

Follow-on IPPD Study

Now that more detailed guidance in the form of our *DoD IPPD Handbook* is available, we need to ensure that appropriate training is provided to current and future members of the acquisition workforce. A training videotape will soon be available from the Defense Acquisition University (DAU), and a formal course is under joint development by our office and DAU. A follow-on study has also been initiated to look at the maturity of IPPD implementation across a broad spectrum of programs, and to bring forward the lessons learned on what works and what doesn’t. We want to find successful examples of IPPD implementation – including the pitfalls to avoid and the barriers to eliminate – and make all this information conveniently available to you.

Want to Volunteer?

If you have good or bad lessons learned or you believe your program or project is “Best In Its Class,” why not share your observations and experiences with other program managers? Just think how you

will be helping your fellow program managers, while simultaneously broadcasting the successes of your program.

We want to encourage you to participate in our IPPD study. We also welcome any information that you may want to submit anonymously or informally (without participating in the formal study).

Finally, we would like to know your response to the handbook. What helped? What didn't? How can we change the handbook to help you better, and what format do you think would be especially helpful for disseminating the results of our study? Contact Tom Parry at (703) 695-2300 or parrytj@acq.osd.mil.

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3. DoD Regulation 5000.2-R, Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automated Information System (MAIS) Acquisition Programs (OSD, March 23, 1998).
4. *DoD Guide to IPPD* (Office of Systems Engineering, OUSD[A&T], Feb. 5, 1996). View the Guide online at <http://www.acq.osd.mil/te/pubdocs.html>.

<http://www.acq.osd.mil/te/pubdocs.html>.

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6. *DoD IPPD Handbook* (Office of Systems Engineering, OUSD[A&T], August 1998). View the handbook online at http://www.acq.osd.mil/te/programs/se/ippd/ippd_pubs.html.
7. For a further discussion of STEP, see "Meet 'MASTER' – Modeling & Simulation Test & Evaluation Reform," *Program Manager*, March-April 1999, p. 8.

ST. LOUIS CHOSEN FOR DOD'S 1999 MAINTENANCE SYMPOSIUM

The 1999 Department of Defense Maintenance Symposium and Exhibition will be held Nov. 15-18, at the Regal Riverfront Hotel, St. Louis, Mo. The theme for this year's symposium, which is co-sponsored by the National Defense Industrial Association, is "Transforming Maintenance with Technology."

Maintenance comprises the largest of DoD's logistics workforces, with more than 500,000 personnel and annual appropriations of more than \$40 billion.

This third annual conference is the single opportunity for the entire DoD maintenance community to come together to share information and focus on weapons systems and equipment maintenance. Maintenance managers, both military and civilian, from all ranks and Services will be in attendance. They represent the full range of DoD's maintenance operations, including depots, operating commands and units, and research and development activities, along with their commercial industry counterparts.

Senior Defense officials and congressional representatives also will attend and participate in the conference. In addition, the DoD Maintenance Awards are presented to outstanding maintenance units at a special awards banquet held during the symposium.

Symposium planners say their agenda will address key challenges and explore common interests for maintenance management systems and process technologies that will transform maintenance operations for the 21st century. Seminar sessions will:

- Identify the major management issues for maintenance.

- Review management and technical solutions in design or development.
- Demonstrate technology applications for maintenance management and processes.
- Identify needs for new management tools, research and products.
- Showcase world-class operations.

The entire 1999 DoD Maintenance Symposium is open for press coverage. The media point of contact is Glenn Flood, (703) 695-6294.

Editor's Note: This information, released July 20 by the Office of the Assistant Secretary of Defense (Public Affairs), is in the public domain at <http://www.defenselink.mil/news> on the Internet.



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